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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

INTER-OFFICE CORRESPONDENCE

DATE: August 20 - September 26, 1975

MEMO TO: Division of Water Pollution Control - Field Operations Section

G. T. Bachman, EPE, DWPC/FOS, Region III-C GTB

DOUGLAS COUNTY (Tuscola) - Cabot Corporation
Deep Well Failure
Pollutional Discharges

Surveillance of Cabot Corporation operations during reversal of their deep well is summarized below.

August 20: Plant Manager Mike Fowler contacted the writer and advised that they suspected a break had occurred in the well tubing. Plans were being made to hold the material normally disposed of in the well in the bermed off area used during the last breakdown of the well in April of this year. Steps to set up neutralization for possible subsequent discharge to waters of the state were also being initiated. His "well people" were on their way to assess the situation and Ward Akers of the Variance and Technical Analyses Section would be called following our discussion. Fowler indicated he would provide us with 24 hours advance notice of any anticipated discharge.

August 22: The writer contacted Fowler. An apparent break had been located and they were currently fishing for the remaining piping after which the casing would be logged and the well restored. It would be Sunday night (August 24) at the earliest before the well could be back in service. In the meantime, neutralization and holding was still underway and it appeared adequate storage would be available to prevent the need to discharge.

August 24: Fowler called at 11:00 p.m. For some reason, the well has reversed itself and they now have a small geyser erupting out of the hole. It appears that a discharge will occur. Akers' group will be notified first thing Monday morning.

August 25: Contacted Fowler at 8:30 a.m. A ten-foot column of water with a pH of 1-2 is still spewing out onto the ground around the well. The well will have to be capped and this may take one to two days. Apparently a gas pocket had entered the well producing a column of foam instead of a column of water allowing the flow to reverse itself. They will try to transfer everything to the neutralization tank then to the bermed off area before discharging. The writer recommended that they attempt to provide additional storage facilities as the neutralized

flow would still produce high TDS and chlorides downstream as well as erratic pH's and unnatural precipitates. The latter effects might be damped out somewhat by the storage capacity. Fowler indicated a continuous pH probe was being set up in the property line box to measure any flow leaving their property.

Contacted Ward Akers at 9:00 a.m. and agreed to meet at Cabot at 1:00 p.m.

At 1:00 p.m., the writer, K.L. Baumann, Ward Akers, Don Dillenburg, and Geological Survey personnel met with several Cabot personnel including Fowler and Bob Johnson of their Pampa, Texas, office. Developments of the past few days leading up to the reversal of the well about 8:00 p.m. the preceding night were discussed. At the present time, the backflow rate was estimated at 250 to 300 gpm with a pH of 0.5. It did not appear to be dying out. Plans were to utilize 100% rubber suits and enclosed Scott air packs to allow experienced well men to enter the area and cap the well. This may take anywhere from two to seven days depending on working out trial runs and how much time the suits limit men to work in that environment.

Once the well is capped, the casing will have to be checked for damage. If severely damaged, it will be at least two months before the recently approved second well is completed leaving them in a bind for wastewater disposal. The acidic wastewater could be neutralized but not retained. Possible alternatives to discharging including leasing additional land or utilizing USI facilities were discussed.

At present, they have found some more storage capacity and are trying to contain the well discharge in the immediate area and transfer it to storage from the last box tributary to the property line box using portable pumps. The outlet line on this last box has been blocked off to prevent flow from leaving their property. (See attached pictures) Straw was also placed in the property line box to hopefully catch any oil from the annulus that was blown out when the well reversed and escaped before the line was blocked off.

Despite the above efforts, some flow was leaving their property by leaking around the seal and through other field tiles draining the area and tributary to the property line box downstream of the seal. But the volume leaving compared to the volume being retained and handled was believed to be small. The attached pictures further describe the situation.

A sampling survey was conducted to determine the effect of that portion of the flow leaving their property. Locations used throughout this episode are shown on the attached map (with the exception of B-1 and B-2) and are described below.

B-1: Field tile from northwest at property line box. This tile may pick up drainage from area where the flow from the well is accumulating.

B-2: Total flow leaving Cabot property including B-1, leakage around the sealed box upstream, and a third field tile from the southwest.

C-1: Outlet of field tile system (Drainage District No. 4)

C-2: Route 45 bridge

C-3: Section road bridge between Route 45 and I-57.

C-4: First section road bridge east of I-57.

C-5: Filson Road bridge

C-6: Route 130 bridge

All lab sheets have been cross referenced with the above sample location designations.

Results of the survey on August 25 are summarized below:

LOCATION	pH	Cl (mg/l)	TS/EC (mg/l)	ROE (mg/l)	COMMENTS
B-1	2.7	4,500	—	8,246	Clear
B-2	0.3	40,000	—	50,763	Brown turbidity; 60-70 gpm; petrolei like odor.
C-1	0.4	36,100	—	45,377	Same appearance as B-2.
C-2	0.5	28,100	—	36,734	Same as above.
C-3	1.7	10,050	—	14,807	Light turbidity.
C-4	Did not sample.				Clear; no physical indication of any effect here yet.

August 26: At 8:30 a.m. following receipt of the above results from the lab, the writer contacted Fowler. It was suggested that attempts be made to feed liquid caustic to the flow leaving their property if those low pH's persisted. Careful control was emphasized. He reported the pH at B-2 was 6.3 this morning. The well was still gushing at about the same rate. A first look closeup was to be made by the experienced well men that morning. The writer advised that resampling would be conducted that afternoon.

Results of that survey are summarized below:

LOCATION	pH	Cl (mg/l)	TS/EC (mg/l)	ROE (mg/l)	COMMENTS
B-1	0.8	36,200	—	49,647	Relatively clear.
B-2	1.7	14,300	—	21,152	Light turbidity, visible oil; higher flow than 8/25.
C-1	2.2	4,900	—	7,848	Light turbidity, higher flow.
C-2	2.2	4,350	—	7,573	Turbid but more natural appearance light oil film.
C-3 ,	4.5	2,100	—	4,570	Clear flow.
C-4	7.3	191	—	1,084	Physically okay.

It should be noted that approximately two inches of rain had fallen the preceding night. As on August 25, only two stream miles continued to appear to be affected.

At the plant, the men had progressed to the point of having the connection for the cap in place and should have the well capped off the following morning at the latest. The first storage area was full and the second one had only 2-3 ft. of freeboard remaining. Fowler also advised that the U.S. EPA had been notified of the problem by the attached letter as required by their NPDES permit.

Later that evening, Fowler contacted the writer and advised the well had been capped off at 6:30 p.m. He also reported a third storage area was being constructed.

August 27: Fowler telephoned the writer. Well is under vacuum and pulling 100 gpm of fresh water down it. A rig will be moved in on the 28th to fish out the remaining piping and the casing should be logged on Friday the 29th. He feels approximately five days additional storage is available. The pH is 4.5 at B-2 today and attempts are being made to compensate for the low pH of B-1 by adding liquid caustic as needed in a manhole between the sealed off last box and the property line box. The quantity of water that had pooled around the well is slowly being reduced by pumping back to the storage areas.

August 28: Sampling survey revealed the following:

LOCATION	pH	Cl (mg/l)	TS/EC (mg/l)	ROE (mg/l)	COMMENTS
B-1	6.0	2,790	—	5,460	Relatively clear.
B-2	6.1	3,220	—	5,902	Light turbidity.
C-1	7.0	3,260	—	5,933	Relatively clear.
C-2	7.1	3,420	—	5,990	Brownish turbidity oil film in places
C-3	7.3	3,200	—	5,585	Clear
C-4	8.3	317	—	1,495	Clear, numerous minnows, traces of oil.

As a whole, the stream appeared to be somewhat better although white to brownish-orange bottom deposits had begun to accumulate between C-1 and C-2.

At the plant, the area where the well had overflowed to had been fairly well pumped down. Work was continuing on enlarging and reinforcing the three storage areas. The well will hopefully be back in service by Sunday the 31st at the latest. So far, Fowler indicated $30,000 had been spent on liquid caustic alone to neutralize all the flow which is being stored and that flow leaking out to waters of the State. He felt they were doing as good as could be expected under the circumstances and the writer tended to agree.

August 29: Fowler called at 10:00 a.m. A dike on one of the storage areas had failed and they again had a pooled area developing around the well and to the east along the railroad spur. Attempts were being made to plug the break and prevent this flow from washing out their spur. If it cannot be successfully plugged, it may be necessary to discharge.

At 4:00 p.m., Fowler again called and reported the dike was effectively sealed and the pooled water was being repumped to it. It had not been necessary to discharge anything. The pH at the property line was 5.5 at that time.

September 2: Writer contacted Fowler. A milling tool was being used in the well to push that portion of the tubing they had not been able to pull out on into the formation. This will be followed by the logging process and the well may be back in service on September 3. Their records indicate the pH has generally been in the 5.0-9.0 range at the property line with occasional excursions. It appeared that adequate storage would be available until the well was placed back into service.

September 3: District Fishery Biologist Dick Rogers contacted the Region III-C Office at 4:45 p.m. reporting a fish kill on the Scattering Fork at the Filson Road bridge (C-5). The writer and Tom Smith met Rogers there at 6:00 p.m. and proceeded to conduct a sampling survey back toward C-1. Results are summarized below.

LOCATION	pH	Cl (mg/l)	TS/EC (mg/l)	ROE (mg/l)	COMMENTS
B-2	12.1	1,120	—	2,757	Milky appearance.
C-1	8.3	1,270	—	2,579	Relatively clear with a lot of unnatural bottom deposits.
C-2	Not sampled.				
C-3	8.4	1,450	—	3,003	Relatively clear; orange to brownish white deposits.
C-4	9.3	370	—	1,126	Live and dead minn clear flow, but a of 6-10" deep slud deposits.
C-5	10.8	133	760	——	Milky discoloratio unnatural bottom deposits; dead and live minnows.

Pictures of the stream conditions observed are attached along with Rogers' report which indicates 3,489 minnows were killed valued at $115.47.

At the plant, Bob Vukelich, Shift Superintendent, accompanied the writer to the property line box. The pH meter there read 11.5 and had been up to 13.0 earlier on the strip chart recorder. The flow here had the same milky appearance observed at C-5. It appeared that perhaps a slug of liquid caustic had been released. Vukelich indicated he had overfed caustic just prior to my arrival as he was unaware of some changes made in the feed setup while he had been off duty for four days. It is doubtful that the slug I observed then was the same one that caused the fish kill but it did tend to confirm the theory of what had happened. Apparently, a large enough slug had been released to extend the effects we had previously been monitoring up to C-3 beyond I-57 and into an area where fish life (mainly minnows) existed. The erratic pH and alkalinity resulted in a partial kill of those minnows that could not get out of the main flow stream.

Vukelich was advised of the downstream conditions and the need to exercise more careful control of the caustic feed. I also requested that he advise plant supervisory personnel of my visit.

At approximately 9:00 p.m., Chief Engineer Jack Roaper contacted the writer and the fish kill as well as the increased bottom deposits downstream were discussed. He felt he knew what had happened as he had found an unusually high pH the preceding night also. The need to maintain the 6.0 to 9.0 range was stressed.

Roaper advised the well was nearly ready to go back into service. Don Dillenburg had been there that day and requested one more test before okaying startup again. Throughout this episode, Akers and Dillenburg followed the check out of the well after it was capped. Detailed information on this aspect of the episode has not been included in this report but may be obtained from them.

September 4: Fowler called to report tubing was being placed back in the well today and that it would probably be back in service the next day. We also discussed the fish kill and he indicated he would visit the stream himself to observe the situation that existed.

September 7: Roaper called and indicated the well was back in service as of 3:00 p.m. that day. He indicated it might take a month to get rid of the water they now had stored in their temporary storage facilities. They are still monitoring the property line box and keeping the caustic feed setup available should it be needed. If it is used, Roaper indicated a pH on the low side of the 6.0 to 9.0 range would be maintained to reduce the amount of downstream precipitate forming.

September 11: Well is taking 110 gpm from the main pre-settling lagoon. None of the water in the temporary storage areas has been injected yet as they are first getting ahead of the normal flows that had built up in pre-settling lagoon. Construction on the second well is to begin on the September 15.

September 16: On this date, the writer conducted a followup visit to determine if the stream quality had improved any since the well was placed back into service. A sampling survey produced the following data.

LOCATION	pH	Cl (mg/l)	ROE (mg/l)	SP. COND. by dilution	COMMENTS
B-1	7.3	1,260	3,175	—	Clear
B-2	12.4	450	3,019	—	Turbid; yellow-brow flocculant solids; oil film
C-1	0.2	19,600		195,000*	Turbid; visible oil film; foaming
C-3	0.2	18,300		120,000*	Turbid; foam
C-4	1.7	3,380	5,141	—	Clear; still some foam; traces of previous bottom deposits.

*See lab sheet for explanation of this result.

The stream did not appear to have improved much at all.

At the plant, Fred Ross, Quality Assurance and Lab Supervisor, was contacted. The flow in the property line box at B-2 contained a lot of yellow-brown flocculant solids and visible oil. The tile from the northwest (B-1) was clear while that one from the southwest was carrying a brown collodial type suspension. This line had reportedly been plugged or broken and had just been rodded. The oil appeared to be coming from the line draining the next to last junction box which had formerly been sealed off when the well had been out of service. Mr. Ross was of the opinion that either a slug of caustic had just been added or that one of the sumps in the process area had failed and overflowed to the plant drainage system tributary to the property line box. He indicated the pH had been 1.5 this morning and caustic had probably been added. The low pH may have originally resulted when the sump failed. He was requested to further investigate this and contact me regarding the results.

During the visit, the three temporary storage facilities were observed and found to still contain about four feet of water in them. It was also noted that site preparation for drilling the second well was underway and that the rig was on hand and ready to be set up.

September 18: Fred Ross telephoned and reported the following information. No more caustic has been added. Checks at the property line box have revealed the following since my visit on the 16th.

DATE	TIME	pH	COMMENT
9/16	3:10 p.m.	7.8	—
9/17	10:30 a.m.	6.9	Clear
9/17	1:30 p.m.	7.0	Clear
9/18	8:30 a.m.	6.7	Clear

The problem on the 16th was reported to be an overflow from the "Gallager pump pit". Ross feels that a better backup system or alarms are needed to alert plant personnel when pump failure occurs. At present they check the property line box twice per day and would not be aware of any failure until an unusual discharge was noted at that point or the physical failure of the pump was discovered by plant personnel.

September 25: The writer stopped at C-2 while returning to the office late in the afternoon. The stream had still not improved and in fact had increased bottom deposits of a brownish-orange to red color. A sample was collected and the attached pictures were taken.

LOCATION	pH	Cl (mg/l)	ROE (mg/l)
C-2	4.8	1010	1860

September 26: Contacted Fred Ross by telephone and asked that he again investigate the situation. He later reported back that a small sump serving a drainage ditch around the main presettling ponds in the deep well system had failed due to a float sticking and overflowed to the property line box. The small ditch contained a lot of iron oxide and this was probably the source of the discoloration in his opinion. He also reported the following monitoring data at B-2.

DATE	pH	
9/18	7.1	
9/19	6.7	
9/20	6.3	
9/21	5.1	
9/22	6.9	
9/23	6.7	
9/24	4.3	(discovered off color)
9/25	4.3	

The maintenance crew was working on the problem with the float. But, once again no one was aware of the failure until the water quality at B-2 deteriorated. Mr. Ross indicated that he planned to take up the problem of inadequate backup and/or alarm systems for pump failure with Plant Manager Fowler.

SUMMARY

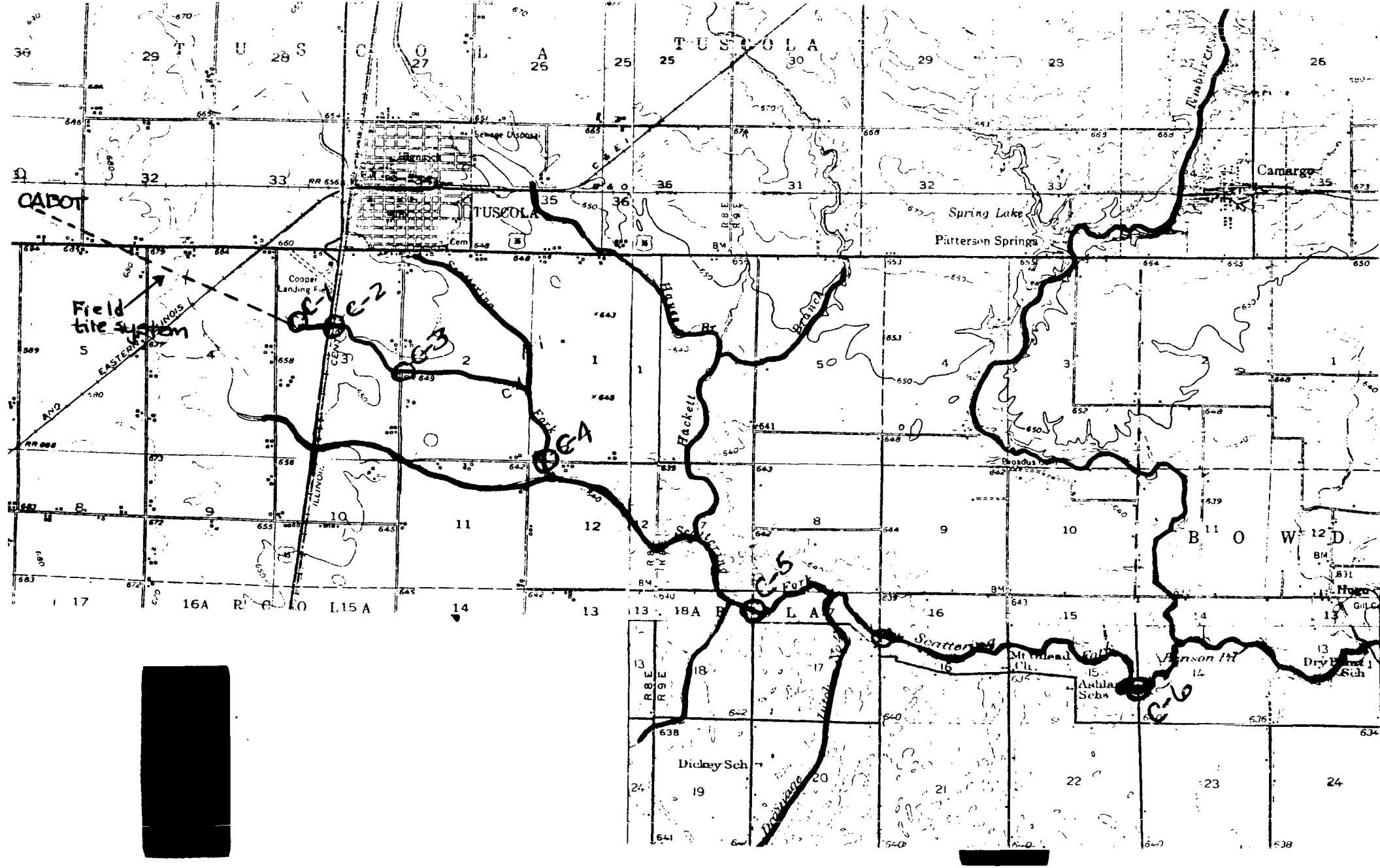
Based on the above surveillance activities, it is concluded that Cabot Corporation violated Section 12(a) of the Environmental Protection Act and Rules 203(a), (b), (f)(chloride and total dissolved solids), 403, 408(a)(pH), and (b) of Chapter 3 on August 25, 26, 28, and September 3, 1975. A fish kill valued at $115.47 also occurred on September 3 and 4, 1975, in the Scattering Fork of the Embarrass River. These violations were due to the unusual occurrence of a deep well reversing its flow and becoming in effect a geyser. Cabot Corporation spent in excess of $30,000 on liquid caustic, temporary storage facilities, equipment, etc., in an attempt to retain as much of the flow as possible and to minimize the effects of that which they could not contain. For this situation in the writer's opinion, Cabot did about as much as could be expected within reason.

Additional violations of the same nature were detected on September 16 and 25, 1975, as a result of sump failures within the plant. In these instances, better backup and/or alarm systems might have prevented further stream degradation.

The attached letter was sent to Cabot requesting payment for the value of the fish, information on steps being taken to prevent reoccurrence of this situation, and pointing out the need for better backup and/or alarm systems on pumps whose failure could lead to a deterioration in the water leaving their plant grounds. Any further action will be contingent on their response to this letter.

Routine surveillance will continue.

GTB:bh/10/23/75
cc: - K. L. Baumann, Region III-C
- John J. Forneris, Region III-S


CABOT
Field tile system
C-1
C-2
C-3
C-4
C-5
C-6
TUSCOLA
Spring Lake
Patterson Springs
Camargo
Cooper Landing Field
Dickey Sch
Ashla Sch
Mt Olivet Ch
Johnson Hill
Hackett Br
Scattering Fork
Drainage Ditch
EASTERN ILLINOIS
CENTRAL ILLINOIS
BOWD